The Future of 3D Printing

It's no novelty. 3D printing has real applications for printers.

3D printing, also known as additive manufacturing, will profoundly change society, from manufacturing (on-demand parts for consumer products, cars, airplanes etc.), to creating human tissue and enabling survival in remote locations (think Mars). At some point, a machine in the home will create food or consumer items selected from a screen. It will be as common an item as the microwave, stove or television.

Today, 3D printing is split into two distinct markets.

"Hobbyists" find the pursuit of building and mastering 3D printers a goal in and of itself. This is the segment that created the 3D printing revolution.

"Makers" are trying to use additive manufacturing to create real value products. This market will generate 3D printing's social impact.

Examples of 3D printing in the marketplace last year included parts on planes (Emirates Airlines), automotive interiors (Ford), biomedical innovations, synthetic food in Israel, surgical prosthetics and military metallurgic parts.

Massivit 3D stole the show at the 2018 SGIA Expo by showcasing the ways 3D technology can be used to create unique, large-format models, channel lettering and backlit signage. Massivit 3D is looking to the future and exploring how signage should be viewed as a 3D object, not a flat 2D sign. By merging props and signage, the company has given us a glimpse of the not-too-distant future.

3D printing can seem a daunting technology. There are a lot of moving parts —software, hardware, consumables, design. The purpose of this article is to provide a starting point in your search to embrace the technology.

It's a Sign

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By Nigel Heywood, KIWO Inc.

Decisions

Before purchasing a 3D printer for signage, make some critical decisions:

- How will the printer be used? Saleable products, prototypes, tinkering with the technology?
- What size will the prints need to be?
- How durable will the printed pieces need to be?
- Will it need to print in color?
- Can signage be assembled from it?
- What is the budget?
- Does anyone on staff have any experience with 3D design?
- Can anyone on staff troubleshoot? 3D printing is not a plug-and-print technology (yet). Issues can and will arise.

improve and perhaps even change how graphics are viewed. Applications such as Americans with Disabilities Act (ADA) signage, channel letters, lithographic backlit images and even unique point-of-purchase (POP) displays illustrate the advantages 3D printing provides for smaller run, custom designs that cannot typically be printed or created without great cost. 3D printing allows the printer to enhance 2D signage, and to create custom displays for cosmetic, toy or any POP subject matter. A simple coffee shop sign can be 3D printed with a cup attached, ADA signage 3D printed with Braille lettering or a museum sign with 3D-printed dinosaur bones.

Technologies

Fusion deposition modeling (FDM), which involves creating an object by extruding molten plastic in layers, using a device that looks like a router with movement in the X, Y and Z planes, is the primary technology for signage. Other 3D printing methods include stereo lithography (SLA), which uses UV or a similar light source to cure a liquid polymer in layers, and selective laser sintering, the fusing of plastic or metal powders with lasers.

Cost and Assembly

3D printers in the FDM market fall into three price categories: below $1,000, $1,000 - $5,000 and over $5,000. 3D printers under $1,000 — the largest category — tend to require some minor assembly, as they come in kits or semi-assembled. This is a fast-evolving and improving area. Printers in the category include the Dremel, Flashforge, Prusa (MK3), Robo, Wanhao and XYZ.

Printers from $1,000 to $5,000 tend to be fully assembled with self-enclosed housings, better components and better product durability. In this category you will find Lulzbot, Robo and Ultimaker.

Above $5,000, you get into the industrial 3D printers, such as 3Dplatform, HP, Makerbot (Method), Massivit 3D, Mimaki, Raise3D and Stratsys. (This is by no means a complete list of manufacturers.)

Build Sizes

With their smaller build volumes, most 3D printers — even the most expensive — can create objects that are relatively

The Massivit 1800 3D Printer. (Image courtesy of Massivit 3D.)

small. With some notable exceptions, 3D printers tend to be limited to less than 12-by-12-by-15 inches. Companies such as 3Dplatform, however, manufacture large-volume 3D FDM printers. The cost for a 40-by-40-inch printer ranges from $18,000 to $50,000. Modix also has large-format printers from around $6,000 for a 50-by-30-by-30-inch build volume.

Materials

Metallurgic 3D printing is evolving fast and capturing headlines, but it is plastic that is used in most printers. FDM works by melting a thin (1.75 millimeters or 3 millimeters) strand of plastic and forming a part. The materials vary from PLA, PETG, ABS, nylon, flexible (TPU) to co-blended plastics that include metal powders within the plastic (carbon fiber, Kevlar, gold, copper, even diamonds!). 3D FDM printed parts can be very strong, but tend not to be as durable as injection molded parts at this time. 3D printed parts can also be hygroscopic, that is, they tend to absorb moisture from the air, unless they're post treated. That also affects longer-term durability. For signage applications, especially interior, this is not an issue.

Designing for 3D

This is the most crucial aspect for 3D printing. Technology is improving, however, to become a maker, you will need to learn to create artwork within a 3D art environment. That includes mastering software such as Fusion360 and SolidWorks to create what you need for your printer. Photoshop and Illustrator also have 3D rendering tools.

Color

3D has been a monochromatic technology so far. Most applications are for components or parts, where color is secondary to durability. However, as applications broaden into areas such as signage, color is becoming essential. Until recently, 3D printed color was "hacked" by printing color in layers (e.g., starting with a white base, then changing the color to red), using multiple nozzles (which has had mixed results) or by gluing parts together. In the past few years, there have been serious attempts to create color parts.

In terms of FDM, the concept of color merging filament is evolving quickly. Chinese manufacturer Geeetech has a color-merging, dual color printer nozzle, or hotend, that can combine filaments to create a true additive color and build objects in solid colors. Late last year, M3D announced the CRANE Quad 3D printer, which merges cyan, magenta, yellow and black filament to create over 50,000 colors. The Prusa Multi Material Upgrade 2.0 allows you to combine four individual colors for its MK3 3D printer.

Mosaic Manufacturing's Palette 2 splices up to four filament colors on demand during the printing process. They are attempting to simplify the process of creating multi-colored objects through innovative software that allows you to paint your 3D file and then allows the Palette 2 to do the rest. The Mosaic approach can be used with almost any 3D

FDM printer. Mosaic caters to the general FDM market, but has an industrial-grade product that can splice filament for real production needs, such as mass-producing 3D printed signage. If you are seriously considering FDM for signage, the Mosaic Palette 2 is an essential tool.

XYZ Printing and Mimaki have also taken an original approach by merging inkjet with FDM and SLA.

Ready to Buy?

3D printers in the sub $1,000 range are available online through consumer sites that provide added protection in the first 30 days or so. There are industry-specific online companies that focus on 3D printers and provide excellent pre-sales service. Over $1,000, go directly to the manufacturer. But due diligence is important! Identify what kind of support the company provides, warranty coverage for specific parts (identify limits) and the warranty process. If this is a printer from China, expect long wait times for parts.

Nigel Heywood, owner of 3dhd World, is a consultant on 3D printing and design, and a product manager for digital products for KIWO Inc. His work with 3D printing includes building additive printers and 3D software such as Fusion 360, Blender and Solidworks. He's been in the U.S. since the mid-1990s, working with companies including Gerber Scientific and Autotype Americas (now MacDermid Autotype).

The Prusa MK3. (Image courtesy of Prusa.)

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The Mosaic Palette 2. (Image courtesy of Mosaic Manufacturing.)